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A New Record of *Desmodiastrum parviflorum* (*Leguminosae*) from Myanmar

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In the course of floristic research of Myanmar, *Desmodiastrum parviflorum* (Dalzell) H. Ohashi was newly found in Myanmar. Characteristics of this species are described in detail with illustrations of a specimen, a flower and variation in the range of leaves. Although this species has been known to be distributed disjunctly in India and Indonesia (E. Java), the present finding provides a stepping-stone connecting both regions and evidence suggesting the floristic relationships between India and Myanmar.

Key words: *Desmodiastrum parviflorum*, *Desmodieae*, *Leguminosae*, Myanmar, new record

Desmodiastrum (Prain) A. Pramanik & Thoth. is a genus of annual herbs distributed in India and Indonesia (E. Java) and attributed to the tribe *Desmodieae* of the subfamily *Papilionoideae* in *Leguminosae* (Pramanik and Thothathri 1986, Kumar and Sane 2003, Ohashi 2005). This genus was first recognized as a subgenus within the genus *Alysicarpus* by Prain (1897) in having a calyx much longer than the first joint of the pod, its teeth not imbricate in fruiting stages and pods as in *Desmodium*, and he included four species in the subgenus, *Alysicarpus belgaumensis* Wight, *A. racemosus* Benth., *A. parviflorus* Dalzell and *A. rotundifolius* Dalzell. Pramanik and Thothathri (1986) raised the subgenus to an independent genus based on such characteristics as calyx and pods as well as supporting evidence from palynology, cytology and chemistry. Then they recognized two species and three varieties, *Desmodiastrum belgaumense* (Wight) A. Pramanik & Thoth., *D. racemosum* (Benth.) A. Pramanik & Thoth. var. *racemosum*, *D. racemosum* var. *parviflorum* (Dalzell) A. Pramanik & Thoth. and *D. racemosum* var. *rotundifolium* (Dalzell ex Prain) A. Pramanik & Thoth. Sanjappa (1992) did not agree with the distinction of the genus *Desmodiastrum* from *Alysicarpus* and kept those four taxa under *Alysicarpus*, while Kumar and Sane (2003) followed the treatment of Pramanik and Thothathri (1986). Nemoto and Ohashi (2003) found significant anatomical differences in the pericarp and joint structures of loments that further support the generic separation of *Desmodiastrum* from *Alysicarpus*.

Those four taxa of *Desmodiastrum* are mainly distributed in India. With respect to the distribution in E. Java of Indonesia, Knapp-

Fig. 1. *Desmodiastrum parviflorum* (Dalzell) H. Ohashi. A. Voucher specimen (N. Tanaka & al. 21030, TUS). B. Two flowers borne from the axil of a primary bract on an inflorescence axis, showing striate primary bract being caducous, no secondary bracts and bracteoles and pedicels covered with brownish spreading hairs. C. Flower with purplish corolla, showing corolla almost within calyx covered with spreading brownish long hairs. D. Pod with 6-articles, showing linear, more or less deflexed, sessile and compressed features. E. Enlargement of D at the proximal three articles, showing two and half articles within calyx. Scale bars (B–E) = 1 mm.

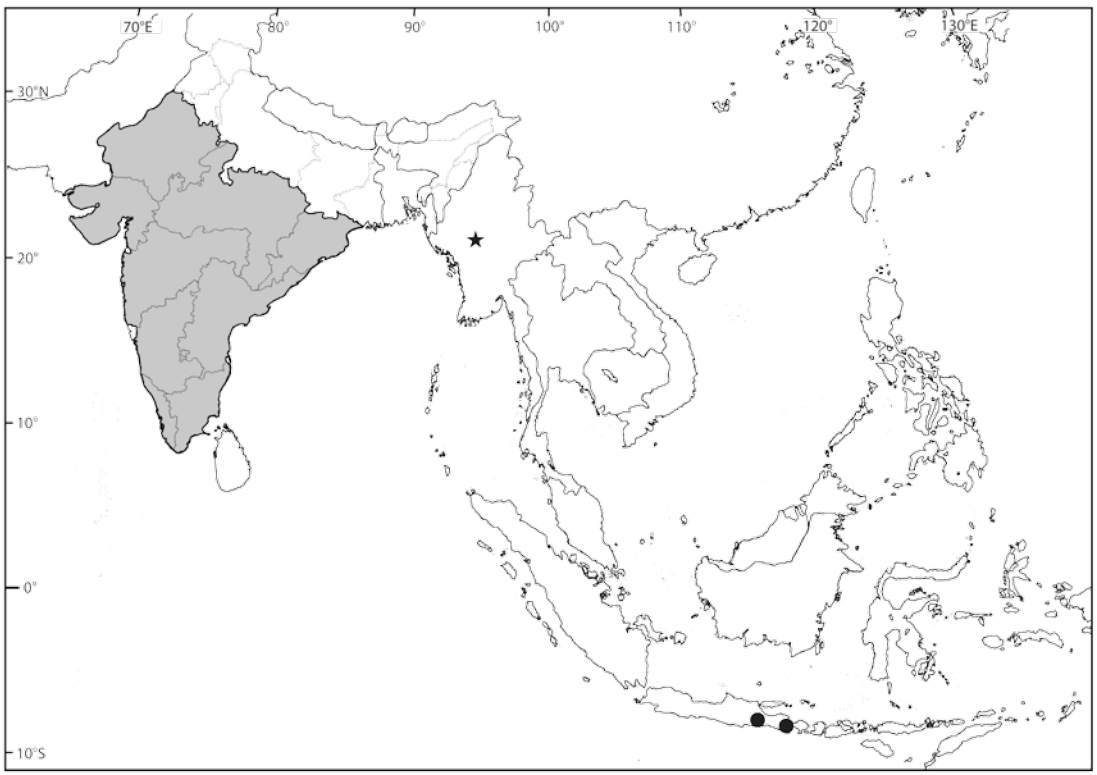

Fig. 2. Distribution map of *Desmodiastrum parviflorum* (Dalzell) H. Ohashi, showing states in India (gray) cited in Kumar and Sane (2003), two localities (Mt. Idjen and Pudjon) in E. Java from Knaap-van Meeuwen (1962) (●) and the locality in Myanmar (★).

van Meeuwen (1962) reported for the first time by publishing the new name *Desmodium alysicarpoides* Meeuwen based on specimens collected from two localities (Mt. Idjen and Pudjon, alt. 1200–1400 m) of E. Java. She noticed these plants as conspecific with *Alysicarpus parviflorus* Dalzell or *Desmodium parviflorum* (Dalzell) Baker (1876) and considered to include them under *Desmodium* not *Alysicarpus*. But the name *Desmodium parviflorum* could not be used under *Desmodium* because it is a later homonym of *Desmodium parviflorum* Mart. & Galeotti (1843), and then a new name must be published. Pramanik and Thothathri (1986) regarded this species as conspecific with *Alysicarpus parviflorus* Dalzell and attributed it to their *Desmodiastrum* as a synonym of *Desmodiastrum racemosum* var. *parviflorum*. Sanjappa (1992) treated *Desmodium alysicarpoides* as a synonym of *Alysicarpus parviflorus* Dalzell, but Lock and Ford (2004) kept this species under *Desmodium*. Ohashi (2004) also regarded this species to be attributed to the genus *Desmodiastrum* following Pramanik and Thothathri (1986), but he distinguished it from *Desmodiastrum racemosum* (Benth.) A. Pramanik & Thoth. in having distinct inflorescences, pods and habit and made a new combination, *Desmodiastrum parviflorum* (Dalzell) H. Ohashi. Thus, *Desmodiastrum parviflorum* has been known distributed in India (nine states of Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan and Tamil Nadu; Kumar and Sane 2003) and disjunctively in E. Java.

The Makino Botanical Garden and its associated institutions have been conducting

plant inventory researches for contributions to the Flora of Myanmar, especially focused on two sites, Mt. Popa and Natma Taung (Mt. Victoria) National Park (Tanaka 2005, Tanaka et al. 2006, Tanaka 2010). Mount Popa (alt. 1518 m; 20°56′N, 95°12′E) is a geographically isolated, extinct volcano that stands within the dry zone lowland savannah in Mandalay Division, central Myanmar. During the botanical survey conducted in October 2000 at Popa Mountain Park, one of us (Murata) collected specimens of *Desmodiastrum parviflorum* along a trail to the peak of Mt. Popa at altitudes between 800 and 1518 m (Figs. 1, 2). This is the first record of this species as well as the genus from Myanmar (cf. Lock and Heald 1994, Kress et al. 2003, Kumar and Sane 2003).

According to Pramanik and Thothathri (1986) *Desmodiastrum parviflorum* is restricted to the hills of Karnataka, Kerala, Maharashtra and Tamil Nadu at altitudes between 700 and 1600 m in India. In Indonesia (E. Java) this species has been known grown at altitudes between 1200 and 1400 m (Knapp-van Meeuwen 1962, Backer and Bakhuizen van den Brink 1963). In Myanmar this species was also collected from a similar altitude as in India and E. Java.

The plants collected from Myanmar have flattened pods, calyx not glumaceous, less than half of the pedicel length (in fruiting stages), not imbricate and much longer than the first article of the pod and also flowers included in or slightly exserted from the calyx (Fig. 1, 3), which agrees with the characteristics of *Desmodiastrum* (Pramanik and Thothathri 1986). They also have pedicels and calyx with brown spreading hairs, calyx with narrow teeth, pods much exserted from calyx, curved, with up to 6-articles and leaves of 1-foliolate mixed with 3-foliolate (Fig. 1, 3, 4), which corresponds to the characteritics of *D. parviflorum* (Dalzell 1851, Prain 1897, Pramanik and Thothathri 1986).

Leaves represent variation in shape as well as organization of leaflet in relation to the size of individuals (Figs. 1A, 4). In individuals smaller than ca. 25 cm tall leaves are all 1-foliolate (Fig. 4A, B), while in larger ones taller than 45 cm 1-foliolate leaves are found below and 3-foliolate ones above (Fig. 4C, D). The shape of leaflet varies from circular below to elliptic above in 1-foliolate leaves of the smaller individuals. The 3-foliolate leaves are borne subsequently to larger and narrower elliptic 1-foliolate ones in the larger individuals. In 3-foliolate leaves the shape of terminal leaflet appears to change from elliptic below to narrower elliptic or narrower ovate above along a shoot (Fig. 4D). Inflorescences are borne even in the smaller individuals with only 1-foliolate leaves (Fig. 1, two individuals mounted on the left side of the sheet).

Desmodiastrum parviflorum (Dalzell) H. Ohashi in J. Jpn. Bot. **79**: 116 (2004).

Alysicarpus parviflorus Dalzell in Hooker's J. Bot. Kew Gard. Misc. **3**: 211 (1851), as "*Alyssicarpus*."

Desmodium alysicarpoides Meeuwen in Reinwardtia **6**: 246 (1962); Backer & Bakh. f., Fl. Java **1**: 609 (1963); Sanjappa, Legumes India 149 (1992); Lock & Ford, Legumes Malesia 146 (2004).

Desmodiastrum racemosum (Benth.) A. Pramanik & Thoth. var. *parviflorum* (Dalzell) A. Pramanik & Thoth. in J. Ind. Bot. Soc. **65**: 377 (1986).

Erect herb with stems up to 50 cm tall, pubescent with spreading pale brownish hairs (0.5–1 mm long) and hooked hairs (ca. 0.2 mm long) in the middle to distal parts, appressed hairs (0.2–0.4 mm long) or glabrous at the proximal parts. Leaves alternate, stipulate, petiolate, 1- or 3-foliolate. Stipules persistent, free, narrowly triangular to narrowly ovate, striate, 1.7–7.5 × 0.5–1.3 mm, glabrous, appressed pubescent at apical margins. Petioles 6–14 mm long in 1-foliolate leaves, 2.3–9 mm long in 3-foliolate leaves, sparsely or densely appressed-pubescent; pulvini 1.3–2.5 mm

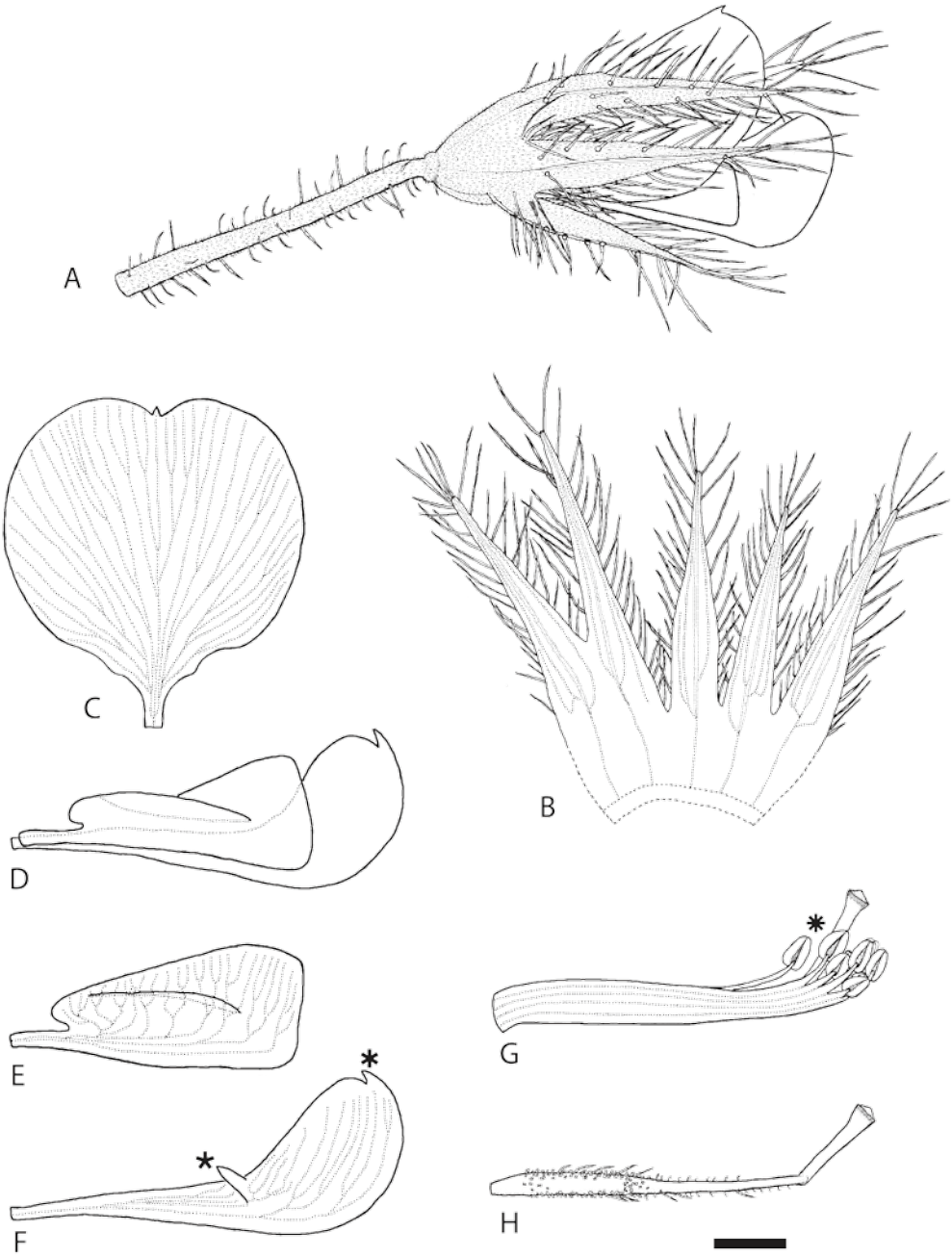

Fig. 3. Flower of *Desmodiastrum parviflorum* (Dalzell) H. Ohashi. A. Flower. B. Calyx dissected, showing the inside. C. Standard. D. Wing and keel-petal, showing their relative length when attached to each other. E. Wing. F. Keel-petal, showing a tiny lamellate appendage (✱) at the base of lamina and a beak-like appendage (✱) at the apex of lamina. G. Stamens surrounding pistil, showing diadelphous staminal tube with separated vexillary stamen (✱). H. Pistil. Scale bar = 1 mm. Voucher: Tanaka & al. 21030 (TUS). Drawing by T. Nemoto.

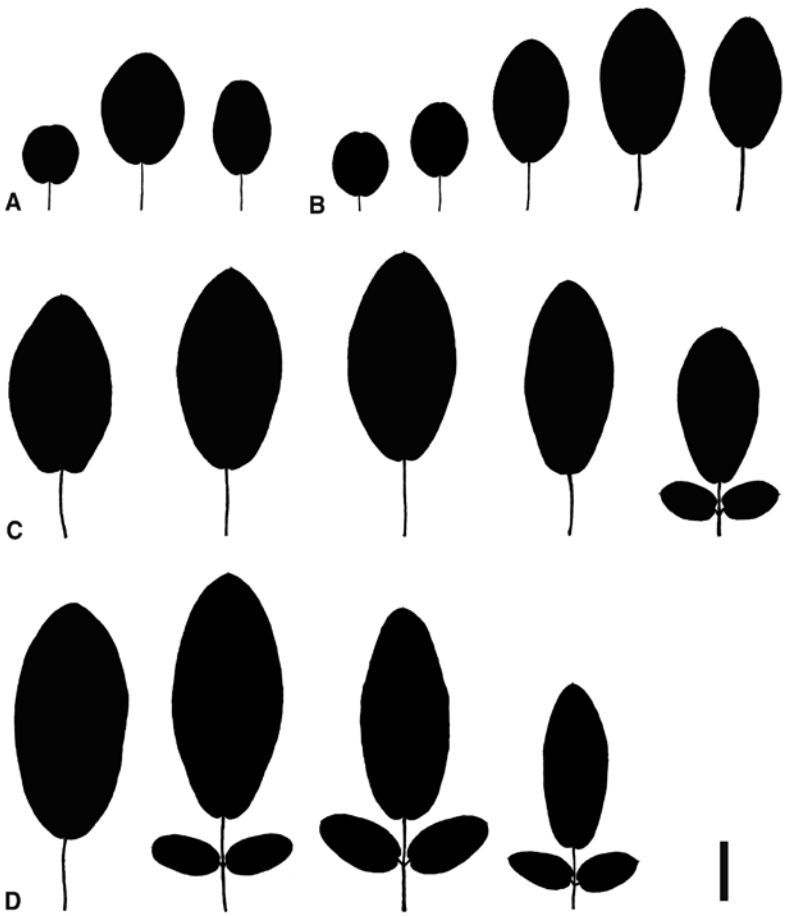

Fig. 4. Leaf silhouettes of *Desmodiastrum parviflorum* (Dalzell) H. Ohashi, showing variation in leaf organization from 1- to 3-foliolate ones and in size and shape of leaflets along a shoot between four different inflorescence-bearing individuals. A, B. Smaller individual with only 1-foliolate leaves (A, ca. 19 cm tall; B, ca. 24 cm tall). C, D. Larger individual with 1-foliolate leaves (below) and 3-foliolate ones (above) (C, ca. 45 cm tall; D, correct size unknown because of no root, but obviously larger than C inferred from the thicker stem). Voucher: Tanaka & al. 21030 (TUS). Scale bar = 1 cm.

long, sparsely or densely appressed-pubescent; rachis longer, slightly shorter than, or almost equal to petiole, 3.3–9 mm long, sparsely appressed-pubescent; petiolules (pulvinules) ca. 1.5 mm long, densely appressed-pubescent, with two stipels (0.5–0.7 mm long, narrowly triangular, early deciduous) at base. Terminal leaflets circular, broadly elliptic, broadly ovate or elliptic in 1-foliolate leaves, elliptic or ovate in 3-foliolate leaves, 8–47 × 7–22 mm, subcordate at base, rounded or emarginate at the apex, sparsely pubescent with spreading or appressed straight or hooked hairs (0.2–0.5 mm long) on veins and with sparsely spreading short hooked hairs (ca. 0.1 mm long) on intervein areas above, densely appressed-pubescent with straight hairs (0.2–1 mm long) beneath, ciliate with brownish straight hairs, lateral veins 5–9 on

each side of the midrib, not reaching the margin of leaflet. Lateral leaflets obviously smaller than the terminal ones, elliptic to ovate, 10.5–17 × 5.5–8.5 mm; petiolules (pulvinules) 0.5–1.3 mm long, densely appressed-pubescent; stipels at the base of petiolule, narrowly triangular, 0.5–1 mm long. Inflorescences terminal, racemose, up to 15 cm; rachides sparsely clothed with spreading longer brownish uncinate hairs (0.5–0.6 mm long) and minute whitish ones (0.1–0.2 mm long) mixed with bulbous glandular hairs (0.5–0.6 mm long); 2-flowered in the axil of primary bract; primary bracts narrowly ovate, acuminate at the apex, scarious, striate, clothed with minute uncinate hairs (0.1–0.2 mm long) on the outside, ciliate with brownish straight hairs, caducous, 5–6.5 × ca. 1.5 mm long; secondary bracts absent. Pedicels ca. 5 mm long in flowers, up to 15.5 mm long in fruits, sparsely clothed with spreading longer brownish uncinate hairs (0.5–0.6 mm long) and minute whitish ones (0.1–0.2 mm long) mixed with bulbous glandular hairs (0.5–0.6 mm long). Bracteoles absent. Flowers ca. 5.7 mm long. Calyx 5–5.5 mm long, 4-lobed, wholly covered with minute uncinate hairs (0.1 mm long) on the outside, mixed with spreading brownish straight hairs (0.5–1.0 mm long) and bulbous glandular hairs (0.4–0.5 mm long) on the surface and margin of lobes; tube ca. 1 mm long; lobes distinctly longer than the tube, narrowly triangular–narrowly ovate; upper lobe 3.8–4.5 mm long, 2-toothed at the apex, teeth 2/3 of the length of the lobe; lateral lobes 3–3.5 mm long; lower lobe 2.5–3 mm long, slightly shorter than other lobes. Corolla purplish white; standard broadly obovate, ca. 4.5 × ca. 4 mm, emarginate at the apex, cuneate–obtuse at the base, not auriculated at the base of the lamina, slightly longer than wings, but distinctly longer than keel-petals; wings right-angled triangular, ca. 4 x ca. 1.7 mm, truncate at the apex, broadest near the apex, auriculate at the base of the lamina, shortly clawed, the claw ca. 0.8 mm long; keel-petals drepaniform, ca. 5.4 × ca. 2.2 mm, distinctly longer than the wings, incurved slightly toward the apex, rounded at the apex, with a tiny beak-like appendage at the apex and a lamellate appendage on the outside at the base of the lamina (connate to wing around the appendage), not auriculated, tapering to a long claw, the claw ca. 2.3 mm long. Stamens 10, ca. 5 mm long, diadelphous; anthers ca. 0.5 × 0.3–0.4 mm. Pistils ca. 5.5 mm long; the style, ca. 3.5 mm long, incurved, slightly thickened at the corner, clothed with multicellular hairs and short uncinate hairs on the proximal half; stigma terminal, capitate; ovary ca. 2 mm long, clothed with appressed short and long multicellular hairs, including 6 ovules; no discs around the ovary. Pods 2–3 times longer than calyx, linear, up to 15 × 1.8 mm long, more or less deflexed, sessile, compressed, upper suture thickened, upper suture slightly constricted between the seeds and lower suture more deeply undulate, isthmus 3/4 as broad as the pod, indehiscent, dark brownish when mature, with (3–4-)5–6-articles; pedicels of pods up to 15.5 mm long; articles broadly elliptic, jointed by narrow necks, ca. 2 × 1.6–1.8 mm, glabrous except most distal one covered with minute hooked and longer multicellular hairs, reticulate-veined. Seeds unknown, immature in our material.

Specimens examined: MYANMAR, Mandalay Division, upper central Myanmar, Kyaukpadaung Township, Popa Mountain Park, along the trail to the peak of Mt. Popa, alt. 800–1518 m, 20°54′N, 95°15′E, flowers yellow, stem red-purple, 1 Nov. 2000, N.Tanaka, J.Murata, M.Miyake, T.Ooi, Than Than Aye & Khin Myo Htwe 21030 (MBK, TI, TUS, Environmental Education Center of Popa Mountain Park).

The flower color was recorded as yellow on the label. From the specimen, however, the standard appears to be whitish on both sides and has purplish spots at the basal center of the inside, and the lamina of wings is purplish and that of keel-petals whitish (Fig. 1C). The flower color, therefore, can be regarded as purplish white. After harvesting the flower color may change to slightly yellowish in such whitish petals as the standard. According to Pramanik and Thothathri (1986) flowers are pink in

Desmodiastrum racemosum which includes *D. parviflorum* as a variety.

From observations on floral morphology, we noticed some characteristics of petals: the keel-petal is attached rather tightly to the inside of the wing at a tiny lamellate appendage of the basal part of the lamina; and keel-petals have a tiny beak-like appendage at the apex (Fig. 3F). With respect to these features we have not yet found any previous descriptions mentioning them. The tiny beak-like appendage of keel-petals was not drawn in the drawings of allied *Desmodiastrum belgaumensis* (Ohashi 2005, drawing by P. Halliday). Although we observed the appendage in plural flowers of our specimens, we need further studies using ample material in order to confirm the stability of the characteristic.

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根本智行[a]，邑田　仁[b]：**マメ科 *Desmodiastrum parviflorum* のミャンマー新記録**

マメ科ヌスビトハギ連 *Desmodiastrum* 属は 4 分類群からなり，このうち 3 分類群はインドにのみ分布し，残りの *D. parviflorum* (Dalzell) H. Ohashi はインド（アーンドラ･プラデーシュ，グジャラート，カルナータカ，ケーララ，マディヤ・プラデーシュ，マハーラーシュトラ，オリッサ，ラージャスターン，タミル・ナードゥの各州）およびインドネシア（ジャワ島東部のイジェン山付近）に隔離分布することが知られていた．2000 年 10 月に著者のうちの 1 人（邑田）らがミャンマー中央部のポパ山で植物相調査を実施した際，頂上へ向かう登山道沿いの標高 800 ～ 1518 m で *D. parviflorum* の標本を採集した．これは種としてだけでなく属としてもミャンマーでの新記録である．この発見によりインドとジャワ島との間を結ぶ飛び石的な分布地点が初めて見つかったことになる．また，この産地の標高は，インドやジャワ島における本種産地と同程度の標高であった．

ミャンマー産の個体は，細長く伸長する花序，茶色の毛で被われている小花柄と萼，細くて 1 脈しか目立たない萼歯，萼より明らかに長くのび，細長くて，背軸側に多少反り返る豆果をもち，葉には 1 小葉と 3 小葉の両方が混じる．これらはいずれも *D. parviflorum* に特徴的な形態である．また，小さい個体では，すべて 1 小葉のみをもち，基部から先端の花序に向かって円形から楕円形へと小葉形が変化し，より大きな個体では基部から先端の花序に向かって楕円形の 1 小葉から楕円形の頂小葉をもつ 3 小葉，そしてやや狭い楕円形あるいはやや狭い卵形の頂小葉をもつ 3 小葉へと変化する傾向がみられた．

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